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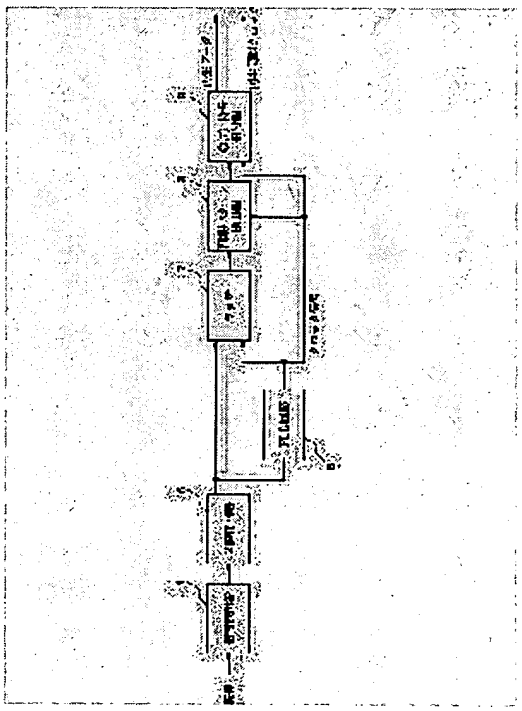
(54) METHOD FOR TRANSMITTING OR RECORDING INFORMATION, INFORMATION RECORDING AND REPRODUCING DEVICE AND INFORMATION TRANSMITTING DEVICE

(57)Abstract:

PURPOSE: To reduce the erroneous detection of a synchronous pattern and to improve the reliability of the recording and reproducing or transmission of information by using the combination of a VFO pattern with an excellent correlative characteristic and the synchronous pattern.

CONSTITUTION: A prescribed pattern for clock synchronization, a synchronizing pattern and 1, 7 RLL code data are read from a medium recording them by a signal detector 4 in a reproducing device. After the information is binarized, and is inputted to a phase locked loop PLL circuit 6 and a clock signal is generated and the binarization signal is synchronized with the clock signal by a latch 7 and the synchronous pattern is detected by a synchronous pattern detector 8. Then, the data succeeding to the synchronous pattern is demodulated by a 1,7 code demodulator 9 and regenerative data and a regenerative synchronous clock are outputted. Thus, the erroneous detection of the synchronous pattern is reduced by using the combination of the VFO pattern with most excellent correlativity and the synchronous pattern in a 1, 7 code.



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[Patent number]

[Date of registration]

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CLAIMS

[Claim(s)]
[Claim 1] In the approach of recording the information which consisted of a VFO pattern for synchronizing a clock, an alignment pattern for recognizing the head of a signal, and RLL (1 7) code data on transmission or a record medium The repeat pattern of "100" is used as said VFO pattern. As an alignment pattern, "1001000100010010101 01010000100101001", "1001010010100101000 10101010010001001", The information transmission or the record approach characterized by using the pattern of either "1001010010100101010 10100010010001001" and "0101010101001000100 10100101001001001."
[Claim 2] The information transmission or the record approach characterized by using the pattern of either "0100101001010010101 01010001001000100" and "0100101001010010101 01000100010010001" as an alignment pattern in the approach of recording the information which consisted of a VFO pattern for synchronizing a clock, an alignment pattern for recognizing the head of a signal, and RLL (1 7) code data on transmission or a record medium, using the repeat pattern of "010" as said VFO pattern.
[Claim 3] A means to record the information which consisted of the alignment patterns and (1 7) RLL code data for recognizing the VFO pattern for synchronizing a clock, and the head of a signal on a record medium, The memory with which consisted of a means to reproduce said information recorded on the record medium, and said playback means remembered the signal of the same pattern as an alignment pattern to be, The circuit which compares the pattern memorized by the alignment pattern reproduced from the record medium, and said memory, In the information record regenerative apparatus equipped with the alignment pattern detector which consists of the circuit which investigates the correlation value of two compared patterns, and the circuit which outputs the signal which shows that the alignment pattern was detected when said correlation value exceeded the predetermined value The repeat pattern of "100" is used as said VFO pattern. As an alignment pattern, "1001000100010010101 01010000100101001", "1001010010100101000 10101010010001001", The information record regenerative apparatus characterized by using the pattern of either "1001010010100101010 10100010010001001" and "0101010101001000100 10100101001001001."
[Claim 4] A means to record the information which consisted of the alignment patterns and (1 7) RLL code data for recognizing the VFO pattern for synchronizing a clock, and the head of a signal on a record medium, The memory with which consisted of a means to reproduce said information recorded on the record medium, and said playback means remembered the signal of the same pattern as an alignment pattern to be, The circuit which compares the pattern memorized by the alignment pattern transmitted from the transmitting means, and said memory, In the information record regenerative apparatus equipped with the alignment pattern detector which consists of the circuit which investigates the correlation value of two compared patterns, and the circuit which outputs the signal which shows that the alignment pattern was detected when said correlation value exceeded the predetermined value The repeat pattern of "010" is used as said VFO pattern. The information record regenerative apparatus characterized by using the pattern of either "0100101001010010101 01010001001000100" and

"0100101001010010101 01000100010010001" as an alignment pattern.
[Claim 5] A transmitting means to transmit the information which consisted of the alignment patterns and (1 7) RLL code data for recognizing the VFO pattern for synchronizing a clock, and the head of a signal, The memory with which consisted of a receiving means to receive said information transmitted from said transmitting means, and said receiving means remembered the signal of the same pattern as an alignment pattern to be, The circuit which compares the pattern memorized by the alignment pattern transmitted from the transmitting means, and said memory, In information-transmission equipment equipped with the alignment pattern detector which consists of the circuit which investigates the correlation value of two compared patterns, and the circuit which outputs the signal which shows that the alignment pattern was detected when said correlation value exceeded the predetermined value The repeat pattern of "100" is used as said VFO pattern. As an alignment pattern, "1001000100010010101 01010000100101001", "1001010010100101000 10101010010001001", Information-transmission equipment characterized by using the pattern of either "1001010010100101010 10100010010001001" and "0101010101001000100 10100101001001001."
[Claim 6] A transmitting means to transmit the information which consisted of the alignment patterns and (1 7) RLL code data for recognizing the VFO pattern for synchronizing a clock, and the head of a signal, The memory with which consisted of a receiving means to receive said information transmitted from said transmitting means, and said receiving means remembered the signal of the same pattern as an alignment pattern to be, The circuit which compares the pattern memorized by the alignment pattern reproduced from the record medium, and said memory, In information-transmission equipment equipped with the alignment pattern detector which consists of the circuit which investigates the correlation value of two compared patterns, and the circuit which outputs the signal which shows that the alignment pattern was detected when said correlation value exceeded the predetermined value The repeat pattern of "010" is used as said VFO pattern. Information-transmission equipment characterized by using the pattern of either "0100101001010010101 01010001001000100" and "0100101001010010101 01000100010010001" as an alignment pattern.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the information-transmission equipment and the information record regenerative apparatus which are used for the approach of recording the information which consisted of a VFO pattern, an alignment pattern, and (1 7) RLL code data on transmission or a record medium, and this approach.
[0002]
[Description of the Prior Art] Conventionally, the RLL (1 7) (Run LengthLimited) sign is known as a coding method of data. Drawing 10 is drawing showing an example of the code translation table of such (1 7) a RLL sign. Here, the binary data of the bit shown in the left column of a table are changed into the data expressed with the channel bit of the right column of a table by the coding network.
[0003] When recording the data by which RLL encoding was carried out as mentioned above (1 7) on transmission or a record medium, data are divided into two or more partitions (sector), and an alignment pattern etc. is added. Drawing 11 is drawing showing an example of a format of such a sector. This example shows the format recorded on record media, such as an optical disk. In drawing 11 , the figure described in the bottom of each block shows a byte count, and 1 byte, i.e., 8 bits, is equivalent to 12 symbols (sign) in a sign (1 7).
[0004] A sector consists of the header field and the recording field. ID of the address, i.e., information, is contained in the header field. Moreover, the data field of the recording field shows the data which should be recorded on a record medium. The above-mentioned address is shown in drawing 11 by sign called AD. VFO shows the fixed period pattern for synchronizing a clock at the time of playback. AS (Address Sync.) and DS (Data Sync.) show the alignment pattern for recognizing the address and the head of data, respectively. Moreover, the field in which PA stores a part for the character remainder in code translation (1 7), and GAP and BUF show the field which is not recorded at all. Since MF, FLG, and LPT are not directly related to this invention, explanation is omitted. Conventionally, the repeat pattern of "100100100100" was used as a VFO pattern, and the pattern "1000101001000101001 00001001010100000" was used as a DS pattern. This DS pattern encodes 3 bytes of the data "6591E2hex" (1 7).
[0005] The information recorded on the medium as mentioned above on the other hand is reproduced by the playback means. The playback means has the alignment pattern detector, by detecting an alignment pattern with this detector, recognizes the head location of data and starts playback of data. A block diagram shows the example of a configuration of such an alignment pattern detector to drawing 12 .
[0006] In drawing 12 , the signal read from the record medium is inputted into a shift register 13 one by one. On the other hand, the right alignment pattern beforehand set to memory 14 is memorized. the alignment pattern memorized by the signal inputted into the shift register 13, and memory 14 -- every 1 bit -- or 1 block is compared at a time. And the correlation value of two compared patterns, i.e., the number of the bits whose values corresponded mutually, is outputted from the number adder circuit 15 of coincidence. This correlation value is compared with a threshold predetermined in the threshold

comparator circuit 16, and when a correlation value exceeds a threshold, the pulse signal which shows that the alignment pattern was detected from the pulse output circuit 17 is outputted. If this pulse signal is outputted, a playback means will reproduce the data recorded on the medium following on the detected alignment pattern.

[0007]

[Problem(s) to be Solved by the Invention] The temporal response of the output value of the number adder circuit 15 of coincidence at the time of detecting the signal which consists of the VFO pattern which consists of the conventional repeat pattern of "100", and the alignment pattern "1000101001000101001 00001001010100000" in the circuit of drawing 12 is shown in drawing 13 . In drawing 13 , an axis of abscissa shows time amount and an axis of ordinate shows the output value of the number adder circuit 15 of coincidence, respectively. In drawing 13 , it is the rightmost column at the right detection time of an alignment pattern. Therefore, if a part with a high correlation value is on the left of this column, possibility of producing a detection error so much will become high.

[0008] The purpose of this invention is by using the combination of a VFO pattern with a sufficient correlation property, and an alignment pattern to offer the information transmission which made min the danger of detecting the mistaken alignment pattern or the record approach, an information record regenerative apparatus, and information-transmission equipment, when it is made in view of the above-mentioned situation and a sign (1 7) is used.

[0009]

[Means for Solving the Problem] In the approach of recording the information which consisted of a VFO pattern for the above-mentioned purpose of this invention to synchronize a clock, an alignment pattern for recognizing the head of a signal, and RLL (1 7) code data on transmission or a record medium The repeat pattern of "100" is used as said VFO pattern. As an alignment pattern, "1001000100010010101 01010000100101001", "1001010010100101000 10101010010001001", It is attained by using the pattern of either "1001010010100101010 10100010010001001" and "0101010101001000100 10100101001001001." Moreover, when the repeat pattern of "010" is used as a VFO pattern, the above-mentioned purpose can be attained by using the pattern of either "0100101001010010101 01010001001000100" and "0100101001010010101 01000100010010001" as an alignment pattern.

[0010] A means to record the information which consisted of the alignment patterns and (1 7) RLL code data for recognizing a VFO pattern for the information regenerative apparatus of this invention synchronizing a clock, and the head of a signal on a record medium, It consists of a means to reproduce said information recorded on the record medium. A playback means The circuit which compares the pattern memorized by the memory which memorized the signal of the same pattern as an alignment pattern, and the alignment pattern reproduced from the record medium and said memory, It has the alignment pattern detector which consists of the circuit which investigates the correlation value of two compared patterns, and the circuit which outputs the signal which shows that the alignment pattern was detected when said correlation value exceeded the predetermined value. And the information regenerative apparatus of this invention attains the same purpose by using one pattern of the six above-mentioned combination as a VFO pattern and an alignment pattern.

[0011] Moreover, a transmitting means to transmit the information which consisted of the alignment patterns and (1 7) RLL code data for recognizing a VFO pattern for the information-transmission equipment of this invention synchronizing a clock, and the head of a signal, It consists of a receiving means to receive said information transmitted from said transmitting means. A receiving means The circuit which compares the pattern memorized by the memory which memorized the signal of the same pattern as an alignment pattern, and the alignment pattern transmitted from the transmitting means and said memory, It has the alignment pattern detector which consists of the circuit which investigates the correlation value of two compared patterns, and the circuit which outputs the signal which shows that the alignment pattern was detected when said correlation value exceeded the predetermined value. And the information-transmission equipment of this invention attains the same purpose by using one pattern of the six above-mentioned combination as a VFO pattern and an alignment pattern.

[0012]

[Example] Drawing 1 is the conceptual diagram showing the 1st example of the information record regenerative apparatus of this invention. In drawing 1 , the record means 1 records a VFO pattern, an alignment pattern, and the information located in a line in order of the code data (1 7) on a record medium 3. In this example, a VFO pattern consists of the repeat pattern of "100." Moreover, an alignment pattern consists of the pattern "1001000100010010101 01010000100101001." This alignment pattern encodes 3 bytes of the data "53EC1Fhex" (1 7). In this example, although information is recorded by the NRZI (Non Return to Zero Inverted) method, it may use RZ (Return to Zero) method.
[0013] The information recorded on the record medium 3 is read by the playback means 2, and playback data and a playback synchronous clock are reproduced. The playback means 2 is constituted as shown in the block diagram of drawing 2 . In drawing 2 , the signal detected from the medium 3 by the signal detecter 4 is changed into a binary pulse signal by the binary-ized circuit 5. This binary pulse signal is inputted into the phase locked loop (PLL) circuit 6, and a clock signal is generated. On the other hand, the output of the binary-ized circuit 5 is synchronized by latch 7 with a clock signal, and an alignment pattern is detected by the alignment pattern detector 8. The alignment pattern detector 8 has a configuration like drawing 12 . If a detection pulse is outputted from an alignment pattern detector in a procedure which was explained previously, the data following an alignment pattern will be decrypted by the sign (1 7) decoder 9. And playback data and a playback synchronous clock are outputted from this decoder 9.
[0014] Here, the temporal response of the output value of the number adder circuit 15 of coincidence of drawing 12 at the time of using the VFO pattern and alignment pattern of this example is shown in drawing 3 . In drawing 3 , an axis of abscissa shows time amount and an axis of ordinate shows the output value of the number adder circuit 15 of coincidence, respectively. In drawing 3 , it is the rightmost column at the right detection time of an alignment pattern. The difference of the correlation value of this rightmost and the highest correlation value at other times is 15. The value of this 15 can be considered to be a margin to the error of the threshold comparator circuit 16 of drawing 12 . That is, in such a graph, the margin to the error of the threshold comparator circuit 16 is large, and the danger of detecting an alignment pattern accidentally is so small that the difference of a correlation value is large when [of the rightmost and others] a correlation value is the highest. when the conventional example and this example which were shown in drawing 13 are compared from this, in the conventional example, the difference of a correlation value is 9 and it turns out that the direction of this example boils an alignment pattern markedly, and can detect it correctly.
[0015] Drawing 4 is drawing in the 2nd example of the information record regenerative apparatus of this invention showing the temporal response of a correlation value. All of the equipment, playback means, and alignment pattern detector of this example are constituted like the 1st example.
[0016] In the 2nd example, a VFO pattern consists of the repeat pattern of "100." Moreover, an alignment pattern consists of the pattern "1001010010100101000 10101010010001001." As drawing 4 shows, also in the 2nd example, the difference of the correlation value by the side of the rightmost which shows the right detection time of an alignment pattern, and the highest correlation value when other is 15. Therefore, also when the alignment pattern of the 2nd example is used, the effectiveness of preventing incorrect detection of an alignment pattern as well as the 1st example is acquired.
[0017] Drawing 5 is drawing in the 3rd example of the information record regenerative apparatus of this invention showing the temporal response of a correlation value. All of the equipment, playback means, and alignment pattern detector of this example are constituted like the 1st example.
[0018] In the 3rd example, a VFO pattern consists of the repeat pattern of "100." Moreover, an alignment pattern consists of the pattern "1001010010100101010 10100010010001001." As drawing 5 shows, also in the 3rd example, the difference of the correlation value by the side of the rightmost which shows the right detection time of an alignment pattern, and the highest correlation value when other is 15. Therefore, also when the alignment pattern of the 3rd example is used, the effectiveness of preventing incorrect detection of an alignment pattern as well as the 1st example is acquired.
[0019] Drawing 6 is drawing in the 4th example of the information record regenerative apparatus of this invention showing the temporal response of a correlation value. All of the equipment, playback means,

and alignment pattern detector of this example are constituted like the 1st example.
[0020] In the 4th example, a VFO pattern consists of the repeat pattern of "100." Moreover, an alignment pattern consists of the pattern "0101010101001000100 10100101001001001." As drawing 6 shows, also in the 4th example, the difference of the correlation value by the side of the rightmost which shows the right detection time of an alignment pattern, and the highest correlation value when other is 15. Therefore, also when the alignment pattern of the 4th example is used, the effectiveness of preventing incorrect detection of an alignment pattern as well as the 1st example is acquired.
[0021] On the conditions of "using a VFO pattern as the repeat pattern of "100", and using an alignment pattern as 3 bytes of symbolized pattern (1 7)", the pattern with a more sufficient correlation property than four alignment patterns shown in the 1st - the 4th example does not exist.
[0022] When a VFO pattern is a repeat pattern of "010", the alignment pattern with the large difference of the correlation value in a right alignment pattern detection time and the highest correlation value at other times differs with the most sufficient namely, correlation property from the pattern of the 1st - the 4th example. Other examples of such this invention are explained below.
[0023] Drawing 7 is drawing in the 5th example of the information record regenerative apparatus of this invention showing the temporal response of a correlation value. All of the equipment, playback means, and alignment pattern detector of this example are constituted like the 1st example. In the 5th example, a VFO pattern consists of the repeat pattern of "010." Moreover, an alignment pattern consists of the pattern "0100101001010010101 01010001001000100." As drawing 7 shows, also in the 5th example, the difference of the correlation value by the side of the rightmost which shows the right detection time of an alignment pattern, and the highest correlation value when other is 15. Therefore, also in the 5th example, the effectiveness of preventing incorrect detection of an alignment pattern as well as the 1st example is acquired.
[0024] Drawing 8 is drawing in the 6th example of the information record regenerative apparatus of this invention showing the temporal response of a correlation value. All of the equipment, playback means, and alignment pattern detector of this example are constituted like the 1st example. In the 6th example, a VFO pattern consists of the repeat pattern of "010." Moreover, an alignment pattern consists of the pattern "0100101001010010101 01000100010010001." As drawing 8 shows, also in the 6th example, the difference of the correlation value by the side of the rightmost which shows the right detection time of an alignment pattern, and the highest correlation value when other is 15. Therefore, also in the 6th example, the effectiveness of preventing incorrect detection of an alignment pattern as well as the 1st example is acquired.
[0025] On the conditions of "using a VFO pattern as the repeat pattern of "010", and using an alignment pattern as 3 bytes of symbolized pattern (1 7)", the pattern with a more sufficient correlation property than two alignment patterns shown in the 5th and 6th examples does not exist.
[0026] As mentioned above, in the 1st - the 6th example, although DS (Data Sync) added in front of record data was made into the example, this invention is applicable also to AS (Address Sync) added in front of address data. In this case, also let AS be 3 bytes of symbolized pattern (1 7).
[0027] This invention can apply the encoded signal to the equipment recorded and reproduced altogether. For example, when this invention is applied to optical-magnetic disc equipment, the record medium 3 of drawing 1 is a magneto-optic disk. Specifically, the record means 1 corresponds to the optical head containing the objective lens which makes the light emitted from light source slack semiconductor laser and laser condense on a disk. Moreover, the signal detecter 4 of the playback means 2 is equivalent to the photodetector which receives the reflected light by the disk of said laser beam through an analyzer.
[0028] Furthermore, this invention is applicable also to information-transmission equipment. Drawing 9 is the block diagram showing the 7th example of this invention applied to information-transmission equipment. In drawing 9 , the transmitting means 10 transmits the information which consisted of the alignment patterns and (1 7) RLL code data for recognizing the VFO pattern for synchronizing a clock, and the head of a signal. The transmitted signal is received by the receiving means 12 through a transmission route 11. The receiving means 12 is constituted like the same configuration as the playback

means of drawing 1 , i.e., drawing 2 . And a receiving means 12 is equipped with the alignment pattern detector which consists of the circuit which compares the pattern memorized by the memory which memorized the signal of the same pattern as an alignment pattern, and the alignment pattern transmitted from the transmitting means and said memory, the circuit which investigate the correlation value of two compared patterns, and the circuit which output the signal which shows that the alignment pattern detected when said correlation value exceeded the predetermined value. And if an alignment pattern is detected, the data following it will be received.

[0029] Also in the 7th example, the combination as the 1st - the 6th example with same VFO pattern and alignment pattern is used. That is, when the repeat pattern of "100" is used as a VFO pattern transmitted from the transmitting means 10, the pattern of either "1001000100010010101 01010000100101001", "1001010010100101000 10101010010001001", "1001010010100101010 10100010010001001" and "0101010101001000100 10100101001001001" is used as an alignment pattern. Moreover, when the repeat pattern of "010" is used as a VFO pattern transmitted from the transmitting means 10, the pattern of either "0100101001010010101 01010001001000100" and "0100101001010010101 01000100010010001" is used as an alignment pattern. Also in this example, the effectiveness that the danger of incorrect-detecting an alignment pattern is made as for an alignment pattern detector to min is acquired.

[0030] This invention is altogether applicable to the equipment which transmits the encoded signal. For example, if this invention is applied to an optical transmission system, the transmission route 11 of drawing 9 corresponds to an optical fiber. Specifically, the transmitting means 10 corresponds to an optical transmitter including light source slack semiconductor laser, a modulation circuit, etc. Moreover, the receiving means 12 is equivalent to an optical receiver including a photodetector, a demodulator circuit, etc. which receive the light which carries out outgoing radiation from an optical fiber.

[0031] Not only the example explained above but various application is possible for this invention. And this invention includes such all applications, unless it deviates from a claim.

[0032]

[Effect of the Invention] As explained above, since this invention used the combination of a VFO pattern and an alignment pattern with the most sufficient correlation property in the sign (1 7), the danger of incorrect detection of an alignment pattern became small, and its dependability of informational record playback or transmission improved.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the conceptual diagram showing an example which applied this invention to the information record regenerative apparatus.
[Drawing 2] It is the block diagram showing the example of a configuration of the playback means of drawing 1 .
[Drawing 3] It is drawing showing the temporal response of the correlation value in the 1st example of this invention.
[Drawing 4] It is drawing showing the temporal response of the correlation value in the 2nd example of this invention.
[Drawing 5] It is drawing showing the temporal response of the correlation value in the 3rd example of this invention.
[Drawing 6] It is drawing showing the temporal response of the correlation value in the 4th example of this invention.
[Drawing 7] It is drawing showing the temporal response of the correlation value in the 5th example of this invention.
[Drawing 8] It is drawing showing the temporal response of the correlation value in the 6th example of this invention.
[Drawing 9] It is the block diagram showing an example which applied this invention to information-transmission equipment.
[Drawing 10] (1 Seven) It is drawing showing an example of the code translation table of a RLL sign.
[Drawing 11] It is drawing showing an example of the sector format of a record medium.
[Drawing 12] It is the block diagram showing the example of a configuration of an alignment pattern detector.
[Drawing 13] It is drawing showing the temporal response of the correlation value in the conventional example.
[Description of Notations]
1 Record Means
2 Playback Means
3 Record Medium
4 Signal Detecter
5 Binary-ized Circuit
6 PLL Circuit
7 Latch
8 Alignment Pattern Detector
9 1, 7 Sign Decoder
10 Transmitting Means
11 Transmission Route
12 Receiving Means

13 Shift Register
14 Memory
15 The Number Adder Circuit of Coincidence
16 Threshold Comparator Circuit
17 Pulse Output Circuit

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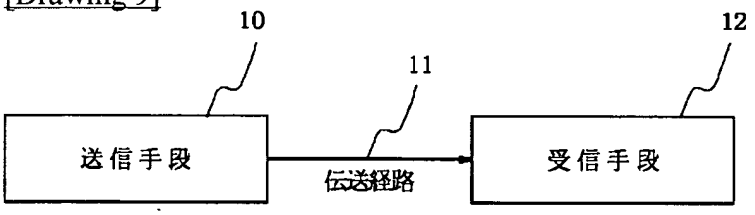
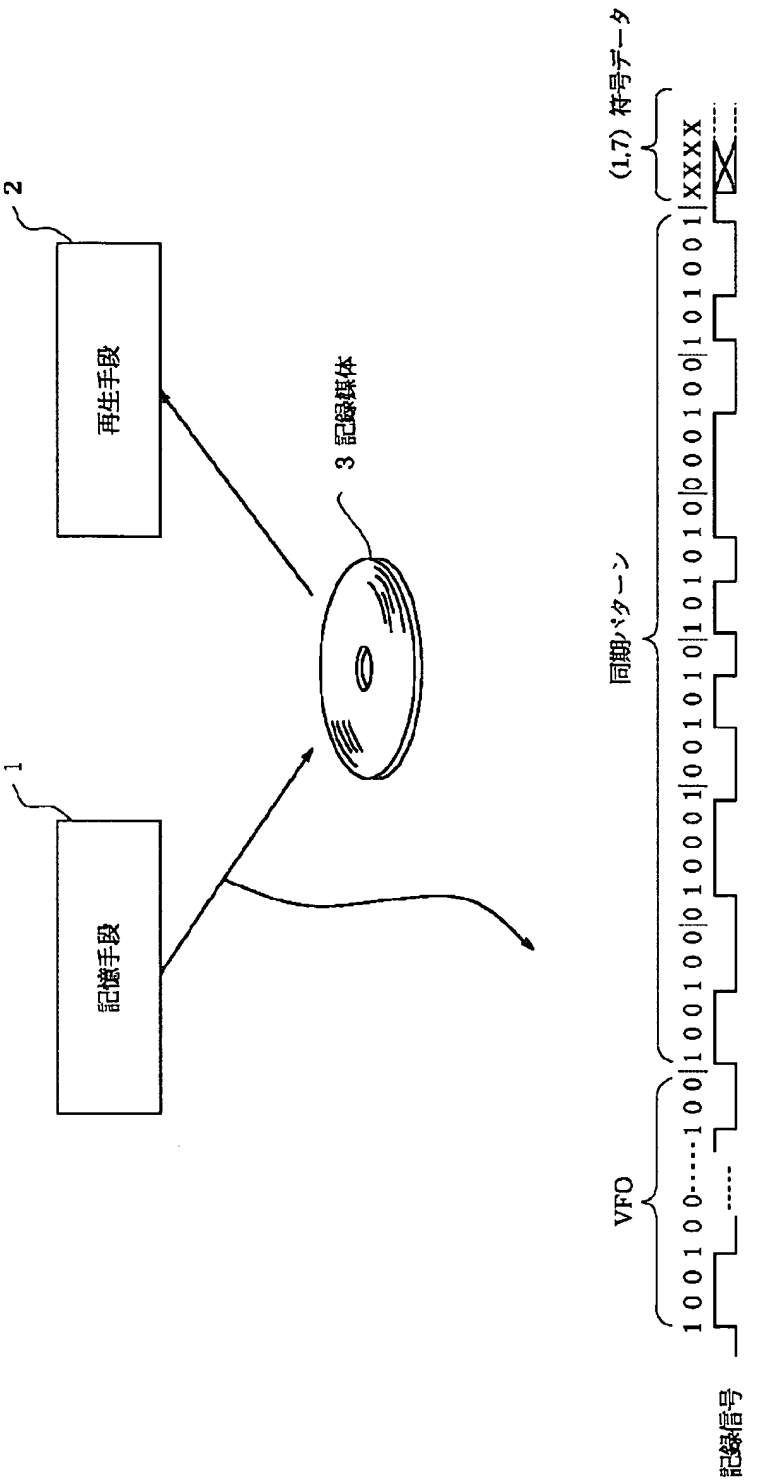
DRAWINGS

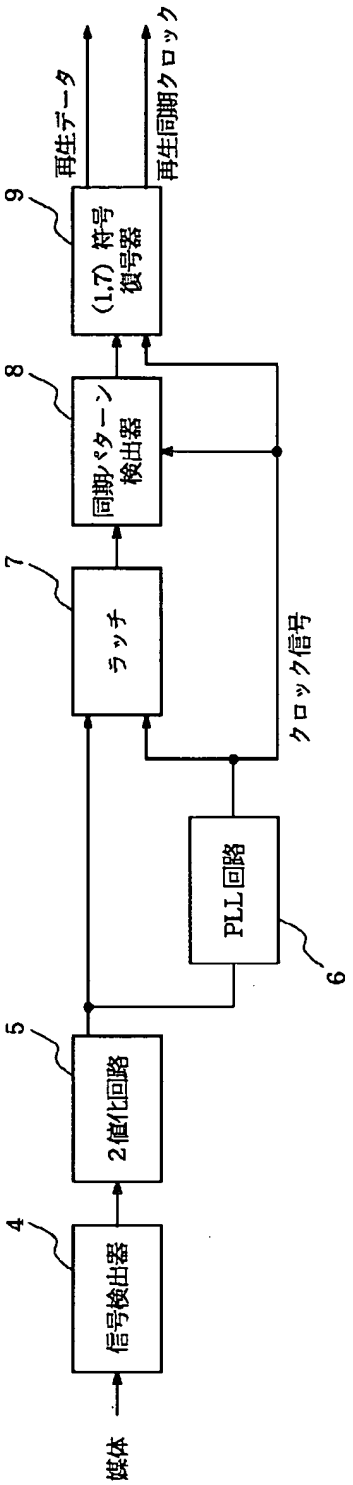
[Drawing 9]



[Drawing 1]


2
再生手段
3 記録媒体
1
記憶手段
記録信号
VFO
同期パターン
(1,7) 符号データ
1 0 0 1 0 0 ---- 1 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 0 0 1 0 1 0 1 0 1 0 0 0 0 0 1 0 0 1 0 0 1 0 1 0 0 0 1 0 0 1 XXXX

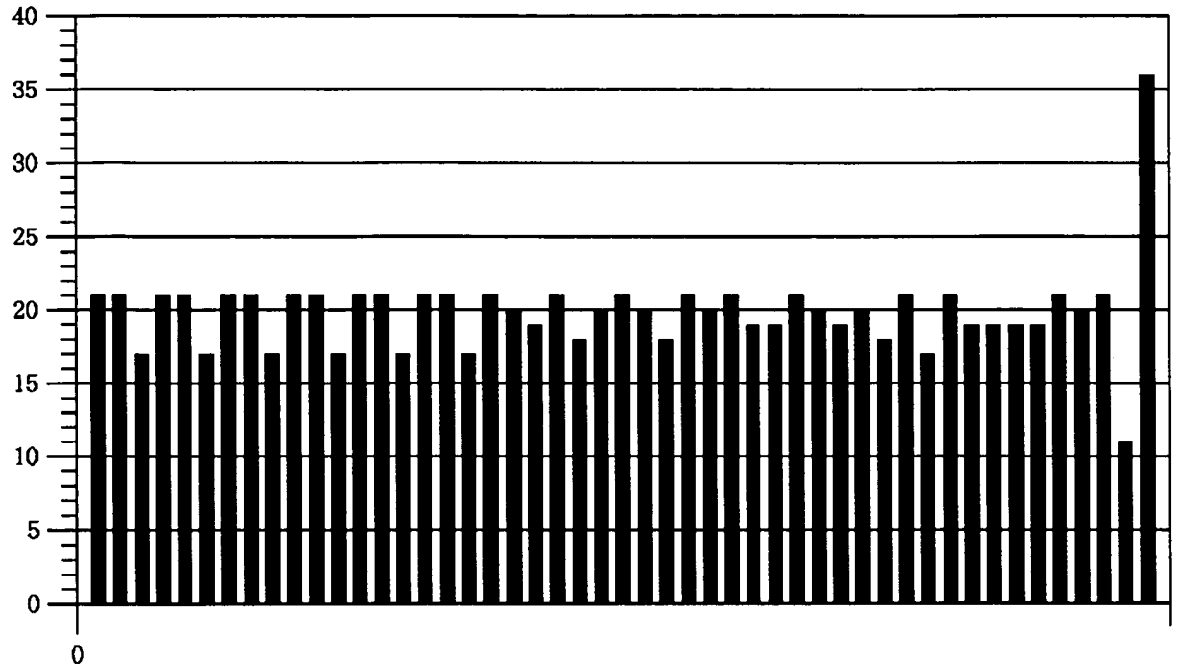
[Drawing 2]


媒体
4
信号検出器
5
2値化回路
6
PLL回路
7
ラッチ
8
同期パターン検出器
9
(1,7) 符号復号器
クロック信号
再生データ
再生同期クロック

[Drawing 3]

VFO “１００１００１００１００”

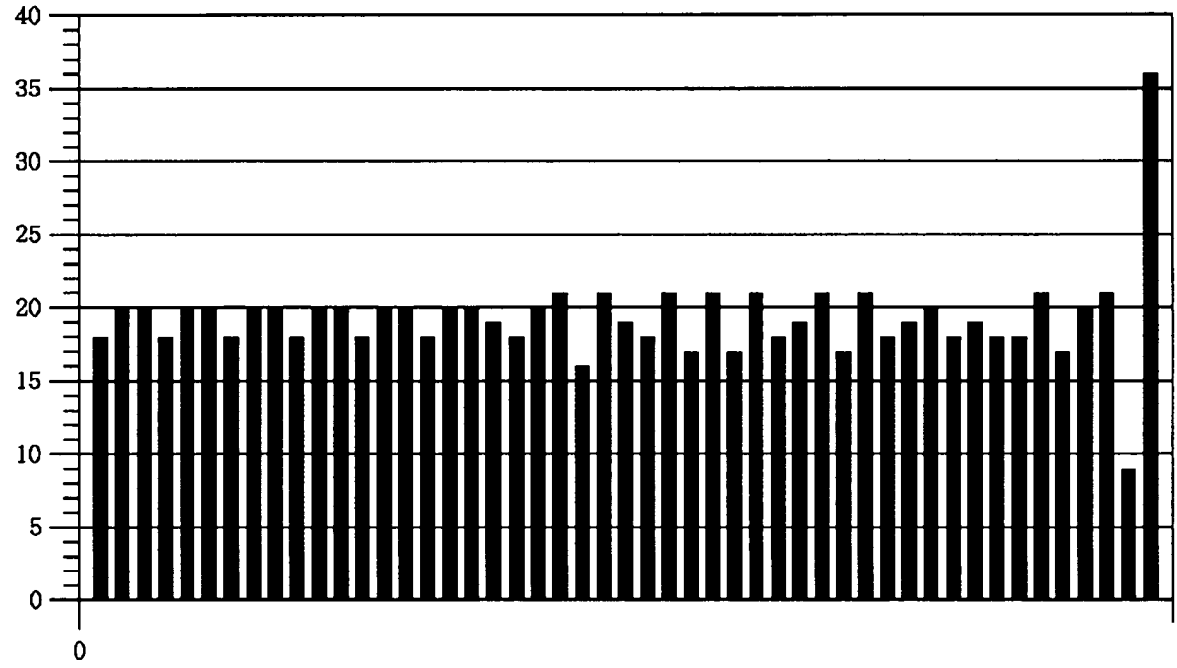
同期パターン “１００１０００１０００１００１０１０１０１０１０００１００１０１００１”



[Drawing 4]

VFO “１００１００１００１００”

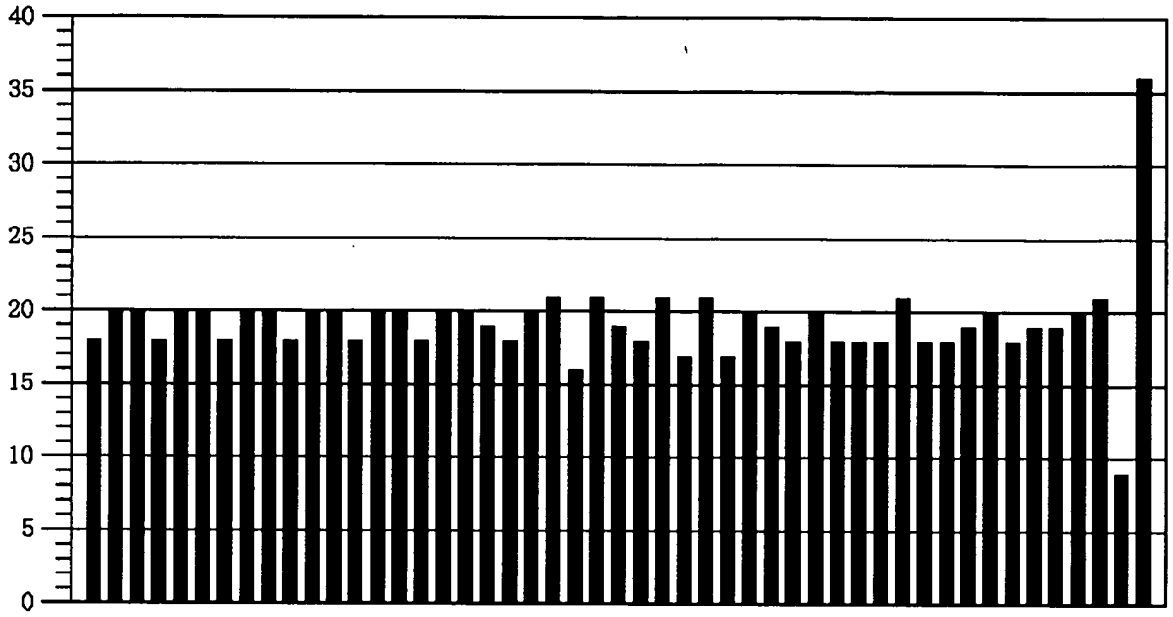
同期パターン “１００１０１００１０１００１０１０００１０１０１０１００１０００１００１”



[Drawing 5]

VFO "100100100100"

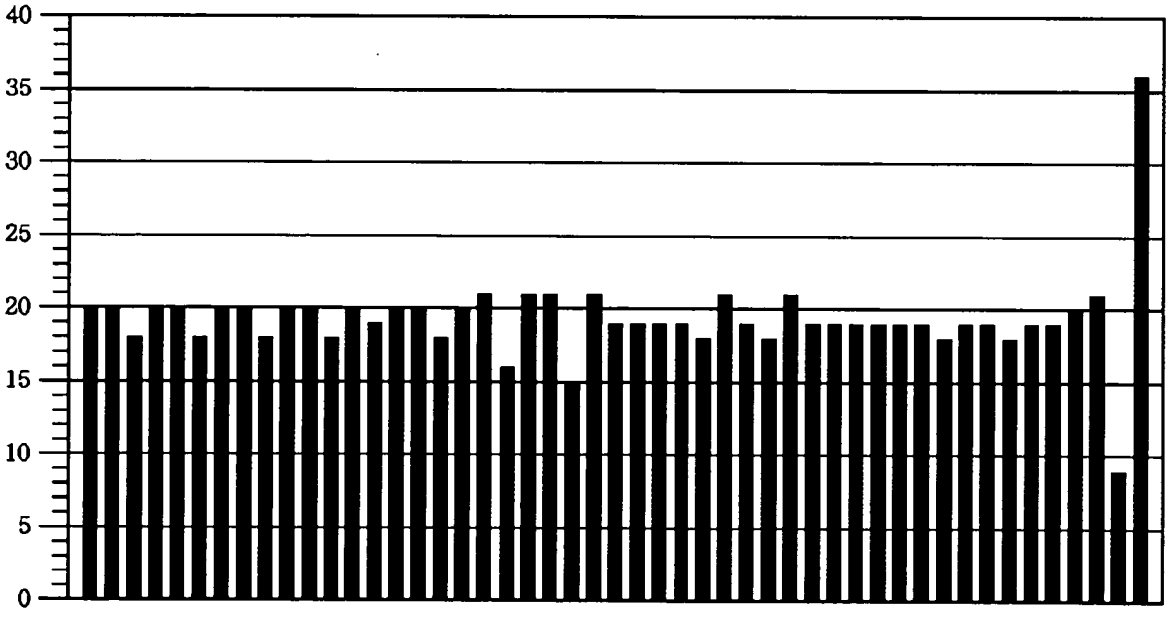
同期パターン "10010100101001010101010001001000100 1"



[Drawing 6]

VFO "100100100100"

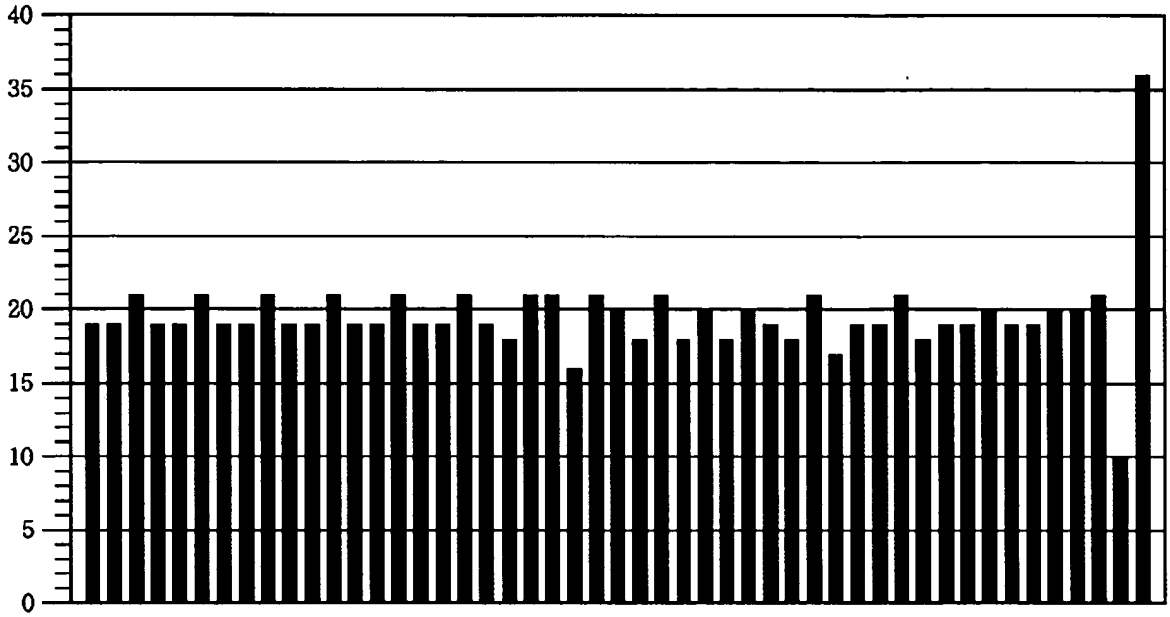
同期パターン "01010101001000100101001010010010001"



[Drawing 7]

VFO “１００１００１００１００”

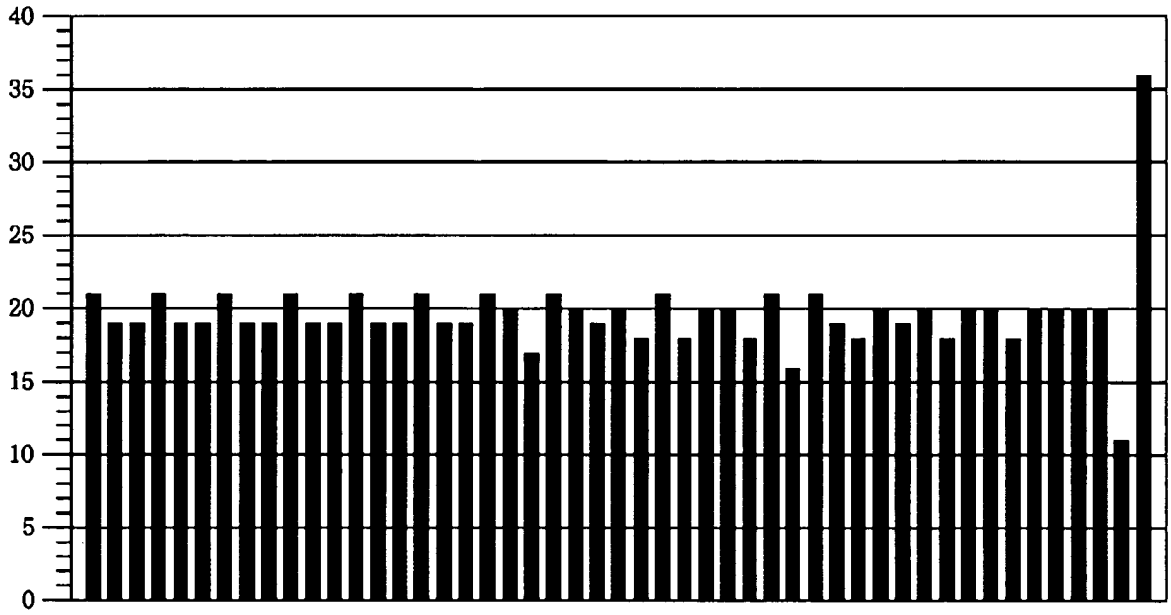
同期パターン “０１００１０１００１０１００１０１０１０１０１０００１００１０００１００”



[Drawing 8]

VFO “０１００１００１００１０”

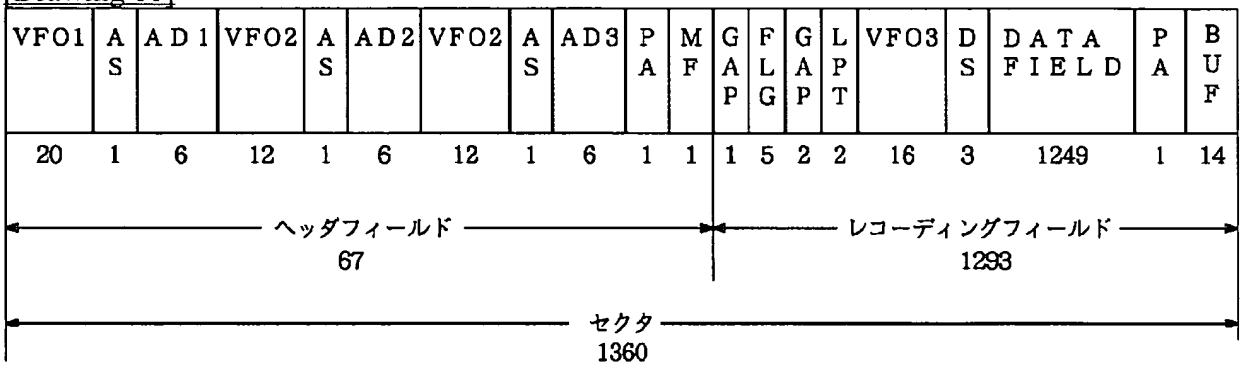
同期パターン “０１００１０１００１０１００１０１０１０１０００１０００１００１０００１”



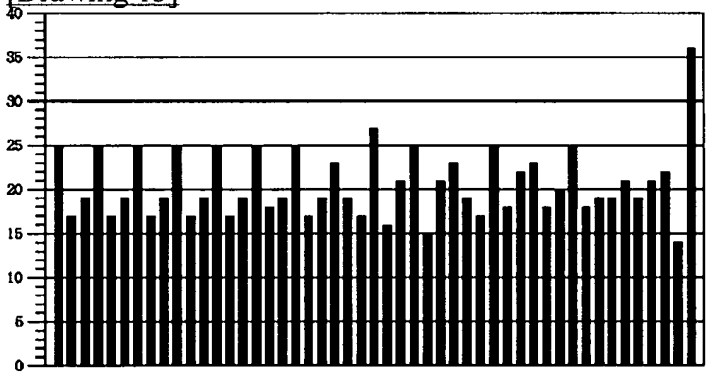
[Drawing 10]

入力ビット	チャンネルビット
01	x00
10	010
11	x01
0001	x00001
0010	x00000
0011	010001
0000	010000

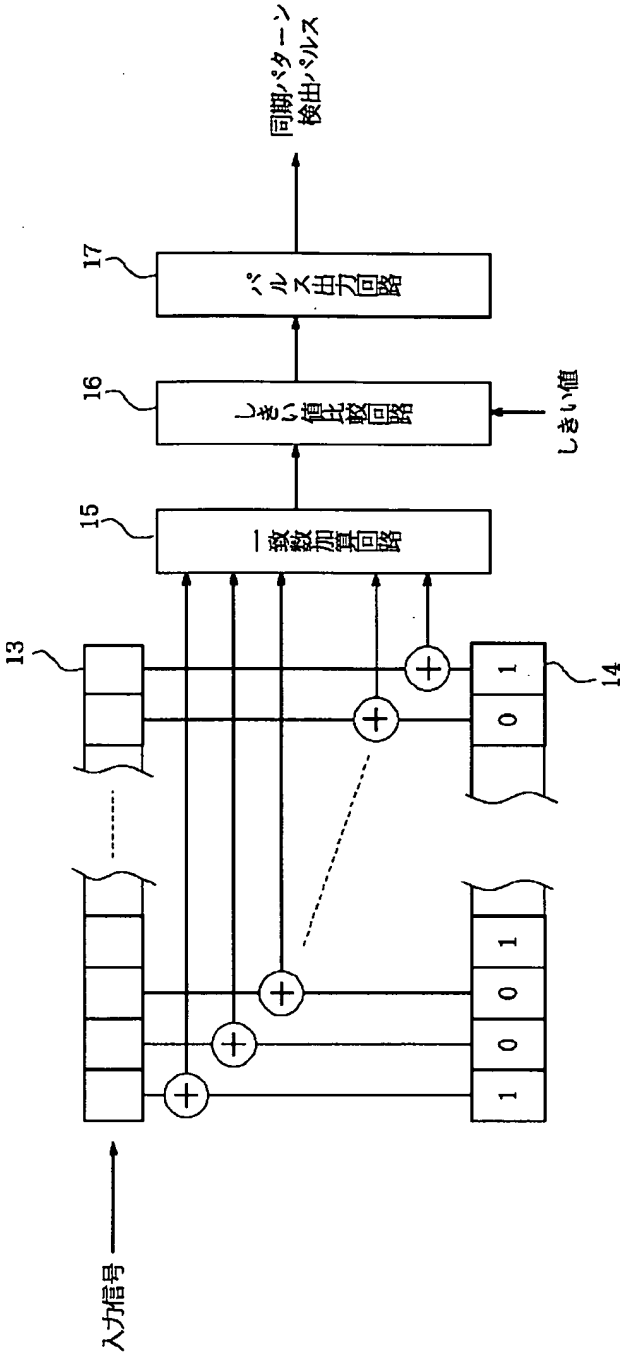
[Drawing 11]



[Drawing 13]



[Drawing 12]



[Translation done.]